WHAT IS CLAIMED IS:

- 1. A chemical analyzer, comprising:
- a flow restrictor receiving a circulating liquid flow comprising a sulfur concentration and having a flow restrictor outlet providing a liquid sample flow that is a portion of the circulating liquid flow;
- a vaporizer receiving the liquid sample flow, the vaporizer providing a vaporized sample flow that includes a portion of the liquid sample flow;
- a combustion chamber receiving the vaporized sample flow and receiving supplies of air and a fuel gas, the combustion chamber providing a combustion exhaust gas in which the sulfur concentration is combusted to sulfur dioxide;
- a pump receiving the combustion exhaust gas at an inlet pressure and providing pressurized combustion exhaust gas at a pressure that is higher than the inlet pressure; and
- a flame photometric detector receiving the pressurized combustion exhaust gas and providing a chemical analysis output indicative of the sulfur concentration in the circulating liquid flow.
- 2. The chemical analyzer of Claim 1 further comprising a cooler coupled to the flow restrictor.

- 3. The chemical analyzer of Claim 1 wherein the flow restrictor comprises a membrane bypass filter.
- 4. The chemical analyzer of Claim 3 wherein the membrane bypass filter has a pore size of about 1 micron.
- 5. The chemical analyzer of Claim 1 wherein the vaporizer comprises a vaporizing liquid injection valve.
- 6. The chemical analyzer of Claim 5 wherein the vaporizing liquid injection valve comprises a dual zone vaporizing liquid injection valve.
- 7. The chemical analyzer of Claim 1 further comprising a back pressure and flow regulation system coupled to the combustion chamber.
- 8. The chemical analyzer of Claim 1 wherein the combustion chamber comprises a flame ionization detector.
- 9. The chemical analyzer of Claim 1 wherein the pump comprises a jet pump.

- 10. The chemical analyzer of Claim 1 further comprising an RSH permeation device coupled to the flame photometric detector.
- 11. The chemical analyzer of Claim 1 further comprising an oven enclosing the vaporizer and the flame photometric detector.
- 12. The chemical analyzer of Claim 11 wherein the oven maintains a temperature of about 225 degrees Centigrade.
- 13. The chemical analyzer of Claim 1 further comprising a flow controller controlling flow of a pressurized gas to the chemical analyzer.
- 14. The chemical analyzer of Claim 13 further comprising a controller controlling delivery of the pressurized gas to the chemical analyzer.
- 15. The chemical analyzer of Claim 1 further comprising a controller calculating the chemical analysis output based on calibration data stored in the controller.
- 16. The chemical analyzer of Claim 1 wherein the circulating liquid flow comprises gasoline and the sulfur concentration in the gasoline is less than 500 ppm.

- 17. A method of measuring a sulfur concentration in qasoline, comprising:
 - receiving a circulating liquid flow of gasoline comprising a sulfur concentration;
 - sampling the circulating liquid flow of gasoline to provide a liquid sample flow;
 - vaporizing at least a portion of the liquid sample flow to provide a vaporized sample flow that includes a portion of the liquid sample flow;
 - combusting at least a portion of the vaporized sample flow to provide a combustion exhaust gas in which the sulfur concentration is combusted to sulfur dioxide;
 - pressurizing at least a portion of the
 combustion exhaust gas to a higher
 pressure;
 - detecting the sulfur dioxide in the pressurized combustion exhaust gas using a flame photometric detector; and
 - calculating an output representative of the sulfur concentration based on the sulfur dioxide detecting.
- 18. The method of Claim 17, further comprising cooling the circulating liquid flow before the sampling.

- 19. The method of Claim 17 and further providing an oven to maintain temperatures of the liquid sample flow, the vaporized sample flow and the combustion exhaust at a preselected temperature.
- 20. The method of Claim 17, further comprising controlling the vaporizing, combusting and detecting with a controller.